



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/992,599	11/06/2001	Sanjay K. Yedur	D546	9923
7590 03/12/2004			EXAMINER	
Jonathan A. Platt Renner, Otto, Boisselle & Sklar, LLP 19th Floor 1621 Euclid Avenue Cleveland, OH 44115			LE, JOHN H	
			ART UNIT	PAPER NUMBER
			2863	

DATE MAILED: 03/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/992,599

Applicant(s)

YEDUR ET AL.

Examiner

John H Le

Art Unit

2863

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 15-21, 32-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4, 6, 8, 9 and 15-21 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 7 and 36 is/are rejected.
- 7) ☒ Claim(s) 32, 33, 34, 35, 37 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

Response to Amendment

1. This office action is in response to applicant's amendment received on 12/08/2003.

Claims 1, 4-9 have been amended.

Claims 10-14 and 22-31 have been cancelled.

Claims 32-37 have been added.

The new figure.4 of drawings has been submitted.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 5, and 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas (USP 5,317,141) in view of Adam et al. (USP 6,225,639).

Regarding claim 1, Thomas teaches an alignment method comprising: determining an apparent location of a metrology mark (e.g. Col.9, lines 11-23, lines 54-66); adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark (e.g. Col.11, lines 13); and aligning another layer according to the adjusted location of the metrology mark (e.g. Col.18, line 45-Col.19, line 2).

Art Unit: 2863

Regarding claim 2, Thomas teaches atomic force microscopy is used in the changes in the mask topography (e.g. Col.9, lines 34-48).

Thomas fails to teach step of detecting a topology of at least one layer and another layer is formed on the at least one layer.

Adam et al. teach steps of detecting a topology of at least one layer (e.g. Col.12, lines 5-17) and another layer is formed on the at least one layer (e.g. Col.9, lines 36-40).

Regarding claim 3, Adam et al. teach determining the apparent location of the metrology mark is determined optically (e.g. Col.4, line 61-Col.5, line 6).

Regarding claim 5, Adam et al. teach determining the apparent location of by determining a topological variation in a topology of the another layer relative to the topology of the at least one layer (e.g. Col.4, lines 35-55).

Regarding claim 36, Adam et al. teach the detecting the topology of at least one layer is performed without coming into physical contact with a surface of at least one layer (e.g. Col.11, lines 46-53).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include step of detecting a topology of at least one layer and the another layer is formed on the at least one layer as taught by Adam et al. in an apparatus and method for high-accuracy alignment of Thomas for the purpose of providing a method of monitoring a patterned transfer process in the manufacture of a semiconductor device that is not limited by the intuition and experience of an engineer making an algorithm determination to determine edges in the critical dimension measurement. (Lin, Col.3, lines 39-47).

Art Unit: 2863

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas (USP 5,317,141) in view of Adam et al. (USP 6,225,639) as applied to claims 1 and 5 above, and further in view of Raeder et al. (USP 6,057,068).

Regarding claim 7, the combination of Thomas and Lin discussed supra, discloses the claimed invention except planarization is performed on a surface of the at least one layer prior to determining the apparent location of the metrology mark.

Raeder et al. teach a device for measuring the planarization efficiency of a planarization process. The device includes a substrate 200 having a plurality of die 202 separated by horizontal and vertical scribe lines 204 and 206. The substrate 200 may further include alignment marks 205 readable by a metrology tool for aligning the tool with a desired location on the substrate 200 (Col.4, lines 15-22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include planarization is performed prior to determining the apparent location of the metrology mark as taught by Raeder et al. in an apparatus and method for high-accuracy alignment of Thomas in view of Adam et al. for the purpose of providing devices for use in measuring the planarization efficiency of a planarization process and methods and systems which perform the measurement using the device (Lin, Col.2, lines 19-22).

Allowable Subject Matter

Art Unit: 2863

5. Claims 32-35, and 37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Claims 4, 6, 8, 9, and 15-21 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 4, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark, wherein determining the apparent location of the metrology mark is determined optically; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein adjusting the apparent location of the metrology mark adjusts for optical horizontal shift. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 6, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark, wherein determining the apparent location of the metrology mark is determined topologically; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning

Art Unit: 2863

another layer according to the adjusted location of the metrology mark, wherein determining the apparent location of by determining a topological variation in a topology of the another layer relative to the topology of the at least one layer and wherein adjusting the apparent location of the metrology mark adjusts for topological horizontal shift. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 8, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein adjusting the apparent location of the metrology mark includes an adjustment for at least one predetermined factor. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 9, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein adjusting the

Art Unit: 2863

apparent location of the metrology mark includes an adjustment for at least one non-predetermined factor. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 15, none of the prior art of record teaches or suggests the combination of an apparatus for alignment, wherein the apparatus comprising a detector for detecting a topology of at least one layer to determine an apparent location of a metrology mark, wherein the apparent location of the metrology mark being offset from the actual position of the metrology mark by a distortion amount; and a mask which is aligned according to the apparent location and adjustment information, wherein the adjustment information corresponds to the distortion amount. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 32, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark, wherein determining the apparent location of the metrology mark is determined optically; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein the another layer is formed on the at least one layer and wherein adjusting the apparent location of the metrology mark adjusts for optical horizontal shift. It is

Art Unit: 2863

these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 33, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark, wherein determining the apparent location of the metrology mark is determined by determining a topological variation in a topology of the another layer relative to the topology of the at least one layer; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein the another layer is formed on the at least one layer and wherein adjusting the apparent location of the metrology mark adjusts for topological horizontal shift. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 34, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein the another layer is formed on the at least one layer and wherein adjusting the apparent

Art Unit: 2863

location of the metrology mark includes an adjustment for at least one predetermined factor. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 35, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein the another layer is formed on the at least one layer and wherein adjusting the apparent location of the metrology mark includes an adjustment for at least one nonpredetermined factor. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 37, none of the prior art of record teaches or suggests the combination of an alignment method, wherein the method comprising steps of detecting a topology of at least one layer; determining an apparent location of a metrology mark; adjusting the apparent location of the metrology mark to determine an adjusted location of the metrology mark; and aligning another layer according to the adjusted location of the metrology mark, wherein the another layer is formed on the at least one layer, wherein the apparent location of the metrology mark being offset from the actual position of the metrology mark by a

Art Unit: 2863

distortion amount. It is these limitations as they are claimed in the combination, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Response to Arguments

7. Applicant's arguments filed 12/08/2003 have been fully considered but they are not persuasive.

-Applicant argues that the prior did not teach steps of "detecting a topology of at least one layer and another layer is formed on the at least one layer".

- Adam et al. teach steps of detecting a topology of at least one layer (e.g. Col.12, lines 5-17) and another layer is formed on the at least one layer (e.g. Col.9, lines 36-40).

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

Art Unit: 2863

calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Specifically Adam et al. has been added to second ground of rejection.

Contact Information

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John H Le whose telephone number is 571-272-2275. The examiner can normally be reached on 9:00 - 5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Barlow can be reached on 571-272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John H. Le

Patent Examiner-Group 2863

February 25, 2004


John Barlow
Supervisory Patent Examiner
Technology Center 2800